The drainage of the market floor is taken by 12 in.
est-iron pipes, supported on brackets secured to the
main girders, and connected with a sewer on the south
side of the market. A central road 50 ft. wide running
across the market, and another one-half that width trau-
versing the entire length of the latter, form the main
arteries of communication to the different blocks into
which the market is broken up.

It may easily be imagined that the exact determina-
tion of the required sections of the numerous continuous
girders supporting the market floor would be an ex-
tremely laborious process if a strictly mathematical
mode of investigation were adopted. A geometrical
process of great simplicity, based upon the principle
of the identity of the sum of the moments of resistance
of any continuous girder with that of the single moment
at the centre of an independent girder of similar span,
was for that reason substituted in the present instance.
This method is shown in Plate XXXIX.

In order to arrive at the maximum strain occurring
upon any part of a continuous girder of any given
number of spans and under a variable load, it is gen-
erally sufficient to ascertain the strains resulting from
three different distributions of the load. In the first
place it will be necessary to consider the whole series
of spans as uniformly loaded with the maximum load,
in order to obtain the maximum strain at the pier,
and at the adjoining portions of the girders. In the
second place, the action of the load when alternate spans
only are loaded must be considered, in order to obtain
the maximum strain at the centres of the more heavily
loaded spans; and, thirdly, the conditions must be
reversed in order to obtain the greatest strain at the
centres of the previously lightly loaded spans. To ob-
tain the maximum strain at any point it will then be
necessary, only, to superimpose, as it were, the several
diagrams representing the strains under the above con-
ditions, and to construct a diagram which shall include
them all. This has been done in the instance of the
Smithfield market girders, and the several stages of the
process are clearly illustrated in the diagrams on
Plate XXXIX.

It will be seen by reference to the general plan of
the markets, Plate XXXVIII, that there are in all
twenty bays of continuous girders, each 240 ft. long
between the extreme bearings, but divided into an ir-
gerous number of spans. The bays selected for illus-
trations consist of nine spans, of which four are placed at
the upper part of the diagram and five below, in order
to suit the size of the paper. In the case of these
girders the live load and dead loads are equal in amount;
hence the "lightly loaded" spans have one half of the
load per foot run imposed upon the fully loaded spans.
The ordinates of the shaded portions of the diagram are
proportional to the strain upon the flange, or, as the
flanges are of uniform width, to the thickness of metal
required in these members. It will be observed that, by
an error of our engraver, the shading has been omitted
on Diagram No. 4 at the small triangular spaces above
the base line; but it will be understood that, in all
cases, the vertical height from the base line to the highest
point of the diagram at any given point is proportional
to the maximum strain to which the girder at that point
is liable.

The curved lines with tangent points on Diagrams
Nos. 1, 2, 3, Plate XXXIX, represent the propor-
tional deflections of the several spans of the continuous
girder under different distributions of the load, and
they are necessarily shown upon the diagrams, as one
of the conditions to be fulfilled in their construction is
that the point in the shaded diagram where the ordina-
te is nil, must be in the same vertical plane as the
tangent point of the deflection curves.

We will endeavour to set forth the mode in which the
diagrams have been constructed; but although the pro-
cess might be exhibited readily enough by actual mani-
pulation, it is not so easily described.

Now, in the first place, the load upon the girders
being taken as uniformly distributed over any parti-
cular span, although not necessarily so upon two con-
iguous spans, it follows that the shaded diagram will be
bounded by parabolic curves. But as an arc of a circle
differs to an inappreciable extent from a parabola, if the
ver. sin. be not greater than say one-eighth of the chord,
the arc may be substituted for the parabola in the con-
struction of the diagrams under consideration.

Again, as within the same limits the versed sines of
arcs of different radii upon a given chord are inversely
proportional to the radii, and as the versed sines of
curves of moments represent the intensity of the
strain which is again proportional to the load per foot,
it follows that the radius of the curve of moments, that
is to say, of the curve bounding the shaded portion of
the diagram, will be inversely proportional to the load
per foot run upon the girder to which it refers.

In the present case we have to deal only with two
different loads per foot run, hence to construct the
shaded portion of the diagram representing the mom-
ents it is merely necessary to provide two pastelboard curves
of some convenient radius to suit the scale of the dia-
gram, and complying with the before-mentioned con-
dition as to the proportion of ver. sin. to chord, one to be
used for the fully loaded spans; and another curve of
double that radius for the lightly loaded girders. If an

* The horizontal scale of the original diagrams, from which
Plate XXXIX was reduced, is double that of the diagrams;
hence, as the vertical scale remained the same, the above condi-
tion is not apparently fulfilled in the engraving, but the necessary
corrections have been made in reducing.